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(11) EP 0 875 355 A1

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
04.11.1998 Bulletin 1998/45

(51) Int. Cl.<sup>6</sup>: B29C 45/27, B29C 45/32,  
B29C 47/58, B29C 47/70

(21) Application number: 97201311.4

(22) Date of filing: 01.05.1997

(84) Designated Contracting States:  
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE

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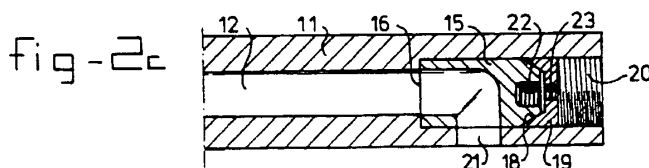
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### (54) Plug for blocking a melt passage in an injection moulding device

(57) The invention relates to a plug for blocking a melt passage (2) in an injection moulding device. The plug comprises a blocking member (15) having on a first end face (16) a bore in the axial direction. The depth of the bore is larger than the diameter of the melt passage. Preferably the blocking member (15) comprises a lower tapering wall portion (18) and a sealing element (19) with a slanting surface for clampingly engaging with the tapered wall portion of the blocking member (25). The sealing member (29) can be pressed against the blocking member (15) by means of a screw member (20). By

use of the plug according to the present invention, an effective sealing is achieved without a cavity being formed in the existing melt passage (2). Thereby the tolerances of forming the chamber which is in axial (15) alignment with the melt passage and into which the blocking member (15) is to be received, are less critical, and manufacture is simplified. No special tools are required for forming the chamber and problems in adjusting the plug length to the depth of the chamber are prevented.



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## Description

The invention relates to a plug for blocking a melt passage in an injection moulding device comprising a blocking member of generally cylindrical shape having in a first end face a blind central bore corresponding in diameter with the melt passage to be blocked and having an outer diameter which is larger than the diameter of the melt passage.

In injection moulding devices, molten thermoplastic material is supplied to one or more nozzles through melt passages in a manifold. The melt passages in the manifold comprise horizontal and vertical channels that are formed by drilling. The passages are re-oriented by blocking these passages and by drilling a transverse channel such that it connects with the blocked channel. According to the known method a cavity is drilled in the axial direction of an existing melt passage. Subsequently an internal thread is provided on the circumferential wall of the bore in which a plug member is then screwed. The plug member comprises on its end face a blind and relatively shallow bore of a diameter corresponding with the diameter of the melt passage which is to be blocked. Thereafter a new channel is drilled into the manifold material, perpendicular or at a predetermined angle to the blocked channel. Hereby the top part of the plug member partly extends into the newly drilled transverse channel. The known construction has as a disadvantage that the depth of the bore into which the plug member is screwed needs to be determined very accurately. Furthermore, large pressures applied by the melt in an axial direction have to be taken up by the screw thread on the plug member. The known construction is also sensitive to leakage caused by inaccuracies. Because the known plug member never exactly abuts against the corner of the bore, a cavity is formed in the melt passage in which the melt can pool up, such that the chance of leakage is increased.

It is an objective of the present invention to provide an improved plug member in which the above disadvantages are mitigated.

Thereby the plug according to the present invention is characterised in that the blocking member comprises a substantially uniform outer diameter, wherein the depth of the bore in the axial direction of the blocking member is not smaller than the diameter of the bore. As the blocking member comprises a single diameter to be fitted, the blocking of the passage is simplified. By providing a relatively deep bore in the first end face of the blocking member, it is possible to drill the new, transverse channel completely below the first end face of the plug member. Hereby the problem of the formation of a cavity due to inaccurate fitment of the plug member in the lower part of the melt passage is prevented. Thereby the tolerances on length of the hole drilled in axial alignment with the melt passage to be blocked and the plug member is less critical. Hence standard tools can be used for forming this hole.

Preferably the blocking member according to the invention comprises a substantially smooth circumferential surface and comprises near a second end face a tapered wall portion, the plug further comprising a sealing member having a generally cylindrical outer surface of substantially equal diameter as the blocking member and having an upper edge comprising a tapering wall portion which on one side is bounded by the cylindrical outer surface and on the other side is bounded by a slanting surface, for engaging with the tapered wall portion of the blocking member.

By contact of the slanting surface of the sealing member and the tapering wall portion at the lower end of the blocking member, the melt passage is effectively sealed. Preferably the sealing member is of a relatively soft material and is pressed against the blocking member by means of a separate screw member which engages with a screw thread on the lower end of the bore in which the blocking member is placed. When pressure is applied in the melt passage by presence of the melt, the blocking member will be pressed against the slanting surfaces of the sealing ring whereby the seal is further improved.

Further, by the use of the plug according to the present invention, the chamber for the blocking member and the new transverse channel can be formed in a single machining step.

An embodiment of a plug according to the present invention will by way of example be explained in detail with reference to the accompanying drawings. In the drawings:

Figures 1a-1c show a known plug for blocking a melt passage, and

Figures 2a-2c show use of the plug according to the present invention.

Figure 1 shows part of a known injection moulding device such a manifold 1 having a melt passage 2 leading for instance to a nozzle. In alignment with the axial direction of the melt passage 2, a stepped chamber 3 is provided with a larger diameter than the melt passage 2. As shown in figure 1b, a stepped blocking member 4, consisting of two parts, is fitted into the chamber 3 for abutting with its end face 6 against the inner end of the chamber 3. The front part of the blocking member 4 is press-fitted into the chamber 3 and is maintained in an abutting relationship by a separate screw part. A seal is formed at the end face 6 and at the stepped face 9 of the blocking member 4. When the chamber length L is too small, no effective seal is obtained at the sealing face 9. If the length L of the chamber is too large, a gap will be formed at the end face 6. Hence, the chamber length L needs to be very accurately controlled and special equipment is needed for forming the chamber 3. Alternatively, the length of the front part of the blocking member 4 needs to be adapted to the chamber length L after forming the chamber 3 in the manifold.

At the first end face 6, the blocking member 4 comprises a bore 5 which is relatively shallow, the depth of the bore 5 being smaller than the diameter of the melt passage 2.

As shown in figure 1c, a new melt passage 7 is drilled transversely to the direction of the melt passage 2. Hereby the melt passage 7 extends above the end face 6 of the blocking member 4, such that a cavity 8 can be formed in which molten material can pool up and which can increase the chances of leakage.

Figure 2 shows the use of a plug according to the present invention, in which first a chamber 13 of uniform diameter is drilled in the axial direction of the melt passage 12 in the manifold 11. The lower part of the chamber 13 is provided with an internal thread 14.

Subsequently the blocking member 15, which comprises a smooth circumferential surface, is clampingly fitted into the upper part of the chamber 13. The bore 17 in the first end face 16 has a relatively large depth compared to the diameter of the melt passage 12. The lower end of the blocking member 15 comprises a tapered wall portion 18. An inner slanting surface of the sealing member 19 engages with the tapered wall portion 18. By means of a screw member 20, the sealing member 19 is pressed against the lower part of the blocking member 15. Because of the soft material of which the sealing member 19 is formed, the sealing member deforms and effectively seals the melt passage 12 at the lower part of the blocking member 15. Suitable materials for use in the sealing member 19 are non-hardened metals which are softer than the blocking member 15 and the screw member 20.

Instead of using a separate screw member 20 it is of course possible to form the screw member 20 and the sealing member 19 from a single piece of material.

As can be seen from figure 2c, the new melt passage 21 is located completely below the first end face 16 of the blocking member 15. It is obvious that the new melt passage does not have to extend at an angle of 90° with respect to the melt passage 21 but can include any desired angle.

For removal of the blocking member 15 or the sealing member 19, these are provided with a threaded bore 22, 23 respectively.

#### Claims

1. Plug for blocking a melt passage in an injection moulding device comprising a blocking member (15) of generally cylindrical shape having in a first end face (16) a blind central bore (17) corresponding in diameter with the melt passage to be blocked and having an outer diameter which is larger than the diameter of the melt passage, characterised in that the blocking member comprises a substantially uniform outer diameter, wherein the depth of the bore (17) in the axial direction of the blocking member (15) not smaller than the diameter of the bore

(17).

2. Plug according to claim 1, characterised in that, the blocking member (15) comprises a substantially smooth circumferential surface and comprises near a second end face a tapered wall portion (18), the plug further comprising a sealing member (19) having a generally cylindrical outer surface of substantially equal diameter as the blocking member and having an upper edge comprising a tapering wall portion which on one side is bounded by the cylindrical outer surface and on the other side is bounded by a slanting surface, for engaging with the tapered wall portion (18) of the blocking member (15).
3. Plug according to claim 1 or 2, characterised in that, the outer surface of the sealing member (19) is substantially smooth, wherein the plug comprises a screw member (20) for abutting against the sealing member (19) and pressing it against the blocking (15) member.
4. Plug according to any of the previous claims, characterised in that, the sealing member (19) is made of a relatively soft material compared to the blocking member (15) and/or the screw member (20).
5. Plug according to any of the previous claims, characterised in that, the blocking member (15) is provided with a threaded bore (22) on its second end face.
6. Plug according to any of the previous claims, characterised in that, the sealing member (15) comprises a threaded bore (23).
7. Injection moulding device comprising a first melt passage (12) and a plug according to any of the previous claims, characterised in that, the device comprises a second melt passage (21) extending transversely to the first melt passage (12) and extending in a radial direction through the blocking member (15) into the first melt passage (12), the walls of the second melt passage (21) both ending in the blocking member (15) at a distance from the first end face (16) of the blocking member (15).

fig-1a

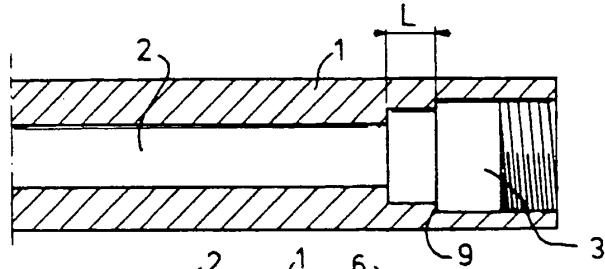


fig-1b

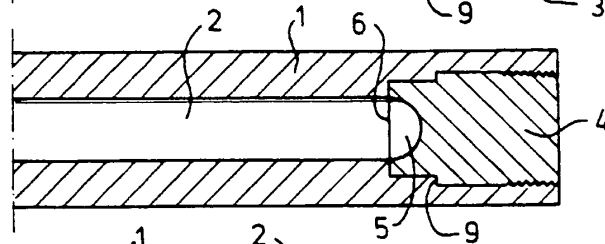


fig-1c

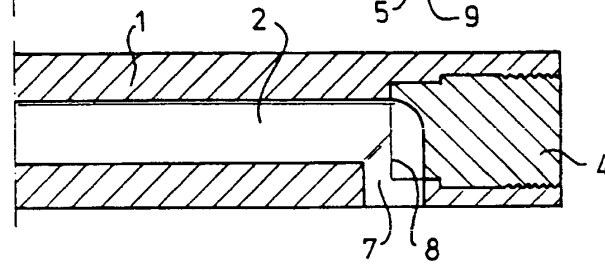


fig-2a

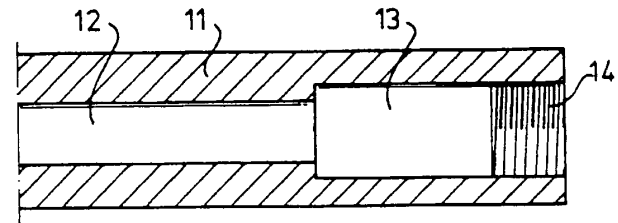


fig-2b

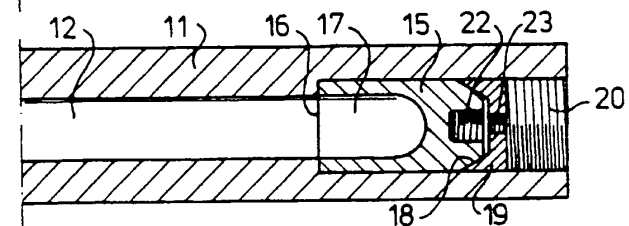
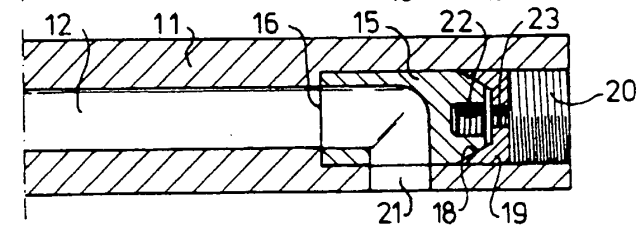


fig-2c





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## EUROPEAN SEARCH REPORT

Application Number  
EP 97 20 1311

DOCUMENTS CONSIDERED TO BE RELEVANT					
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)		
X	EP 0 523 549 A (MOLD MASTERS LTD) 20 January 1993 * claims 1-12; figures 4B,,5 * ---	1-3,5-7	B29C45/27 B29C45/32 B29C47/58 B29C47/70		
X	US 5 366 369 A (GELLERT JOBST U) 22 November 1994 * claim 1; figures 1,2 * ---	1,5,7			
X	US 4 609 138 A (HARRISON ARTHUR) 2 September 1986 * claim 1; figures 3,4 * ---	1,7			
X	EP 0 716 913 A (MOLD MASTERS LTD) 19 June 1996 * claim 1; figures 1,2,6 * ---	1,7			
X	JP 06 328 509 A (TOYOTA MOTOR CORP;OTHERS: 01) 29 November 1994 * abstract * ---	1,7			
A	US 3 945 784 A (COLLINS THOMAS ROBERT STEPHEN) 23 March 1976 * the whole document * -----	1-7	<table border="1"> <thead> <tr> <th>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</th> </tr> </thead> <tbody> <tr> <td>B29C</td> </tr> </tbody> </table>	TECHNICAL FIELDS SEARCHED (Int.Cl.6)	B29C
TECHNICAL FIELDS SEARCHED (Int.Cl.6)					
B29C					
The present search report has been drawn up for all claims					
Place of search MUNICH		Date of completion of the search 3 September 1997	Examiner Dupuis, J-L		
<table border="0"> <tr> <td> <b>CATEGORY OF CITED DOCUMENTS</b>  X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document </td> <td> T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  -----  &amp; : member of the same patent family, corresponding document </td> </tr> </table>				<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document	T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document	T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document				

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